

Response

Applicant: Manoj K. Bhattacharyya et al.

Serial No.: 10/735,941

Filed: Dec. 15, 2003

Docket No.: 10014277-2

Title: MAGNETIC SHIELDING FOR MRAM DEVICES

IN THE CLAIMS**Amendments to the Claims**

This listing of claims will replace all prior versions, and listings, of the claims:

1-12. (Canceled)

13. (Original) A method for shielding a magnetic random access memory module from stray magnetic fields, comprising:

attaching a layer of electrically insulating material adjacent a magnetic memory array in the memory module; and

attaching a layer of permeable metal over the insulating material.

14. (Original) The method of claim 13, wherein attaching a layer of permeable metal over the insulating material comprises sputtering the permeable metal in a rotating magnetic field.

15. (Original) The method of claim 13, wherein attaching a layer of permeable metal over the insulating material comprises:

sputtering the permeable metal; and

annealing the sputtered permeable metal in a rotating magnetic field.

16. (Original) The method of claim 15, wherein annealing the sputtered permeable metal in a rotating magnetic field comprises annealing the sputtered permeable metal while rotating the memory module in an annealing station in the presence of a stationary magnetic field.

17. (Original) The method of claim 15, wherein annealing the sputtered permeable metal in a rotating magnetic field comprises annealing the sputtered permeable metal while rotating a permanent magnet in an annealing station.

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18. (Previously Presented) The method of claim 15, wherein annealing the sputtered permeable metal comprises annealing the permeable metal at a temperature that is lower than an annealing temperature of a magnetic material in the memory module.
19. (Previously Presented) The method of claim 13, wherein attaching a layer of permeable metal comprises adhesively securing a sheet of high permeability metal to the insulating layer.
20. (Original) The method of claim 19, wherein the insulating layer is an adhesive.
21. (Canceled)
22. (Original) A method for shielding a magnetic random access memory module from stray magnetic fields, the method comprising:
- depositing a layer of electrically insulating material over a surface of a magnetic memory array;
 - sputtering a layer of permeable metal layer over the layer of electrically insulating material such that the permeable metal layer extends continuously over the magnetic memory array;
 - annealing the sputtered layer of permeable metal to make the layer of permeable metal isotropic.
23. (Previously Presented) The method of claim 13, wherein the layer of permeable metal comprises a soft magnetic material.
24. (Previously Presented) The method of claim 23, wherein soft magnetic material is selected from the group consisting of iron, nickel, cobalt, alloys of iron, alloys of nickel and alloys of cobalt.

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25. (Previously Presented) The method of claim 13, wherein the layer of permeable metal has a permeability of greater than 10.
26. (Previously Presented) The method of claim 13, wherein the layer of permeable metal has an anisotropy of less than 100 Oe.
27. (Previously Presented) The method of claim 13, wherein the layer of permeable metal is isotropic.
28. (Previously Presented) The method of claim 13, wherein the magnetic memory array in the memory module comprises:
- a plurality of magnetic memory cells; and
 - a pair of write conductors operatively positioned adjacent each of the plurality of magnetic memory cells.
29. (Previously Presented) The method of claim 28, wherein each of the plurality of magnetic memory cells comprises:
- a reference layer having a pinned magnetization;
 - a sense layer having an alterable magnetization; and
 - a dielectric layer separating the reference layer and the sense layer.
30. (Previously Presented) The method of claim 13, wherein the layer of permeable metal has an area larger than an area of the magnetic memory array.
31. (Previously Presented) The method of claim 30, wherein the area of the layer of permeable metal is at least twice the area of the magnetic memory array.
32. (Previously Presented) The method of claim 28, wherein the spacing between the layer of permeable metal and the plurality of memory cells is 10 microns or less.

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33. (Previously Presented) A method for shielding a magnetic memory array from stray magnetic fields, comprising:

covering a first side of the magnetic memory array with a continuous layer of permeable material.

34. (Previously Presented) The method of claim 33, further comprising:

separating the first side of the magnetic memory array from the layer of permeable material with electrically insulating material.

35. (Previously Presented) The method of claim 33, further comprising:

covering a second side of the magnetic memory array with a layer of permeable material.

36. (Previously Presented) The method of claim 35, further comprising:

separating the first and second sides of the magnetic memory array from the layers of permeable material with electrically insulating material.

37. (Previously Presented) The method of claim 33, wherein the layer of permeable material is isotropic.

38. (Previously Presented) The method of claim 33, wherein the layer of permeable material is a soft magnetic material selected from the group consisting of iron, nickel, cobalt, alloys of iron, alloys of nickel and alloys of cobalt.